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Ethnobotanical survey and economic impact of plants used to relieve COVID-19 related infections

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Background: In the wake of the global crisis initiated by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) outbreak, South Africans explored alternative therapeutic strategies. This exploration was driven by vaccine hesitancy, the emergence of diverse SARS-CoV-2 variants, and the enduring challenges posed by the virus.

Aim: This study aims to document medicinal plants with antiviral and anti-inflammatory properties and further report on their economic and social impact during the pandemic.

Setting: The study was conducted through an ethnobotanical survey on medicinal plants with potential of relieving respiratory-related infections and assessing their subsequent economic impact.

Methods: A comprehensive desktop study utilizing search engines such as Google Scholar, PubMed, ScienceDirect, and Scopus was employed for documentation of these plants. Data gathered included plant species, family, parts used, preparation methods, administration routes and conservation status.

Results: The study identified 23 plants from 18 different families that exhibit dual antiviral and anti-inflammatory properties. The study revealed a predominant utilization of the Lamiaceae family (14.8%), with leaves being the most used plant part (31.0%). Medicinal plants were primarily administered orally (75.0%) following preparation by decoction (24.0%). In addition to their reported pharmacological potential, these plants have significant economic value, specifically in rural communities.

Conclusion: Challenges such as the overharvesting of endangered species highlight the need for sustainable practices. The limited data on their immunomodulatory properties also calls for further research to fully validate their therapeutic significance.

Contribution: This study contributes on the knowledge pool of useful medicinal plants against respiratory-related infections with economic potential.

Keywords: anti-inflammation; antiviral; COVID-19; economic and social impact; ethnobotany; medicinal plants; pharmacological activities; respiratory infections.

Introduction

In 2019, the world was introduced to the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which rapidly escalated into a global health and economic crisis (Sharma et al. 2020). In South Africa, like the many nations of the world, there was a struggle to cope with the consequences of the coronavirus disease (COVID-19) pandemic. The healthcare systems were stretched beyond capacity and the economy suffered greatly under the lockdown restriction (Hatefi et al. 2020; Mbunge 2020). The lockdown measures were introduced to try and curb the spread of the virus, and the resultant economic disruptions came with significant social repercussions as there were widespread job losses, mental health challenges and increased social inequalities (Stiegler & Bouchard 2020).

In the face of this global pandemic, communities in South Africa sought solace in their rich botanical heritage, exploring medicinal plants as potential sources of health and economic relief (Hendricks et al. 2021). However, the World Health Organization (WHO) warned against the use of medicinal plants without records of clinical validations and further extended to issue warnings that none of the plant remedies could be recommended for population use (Jain et al. 2024). The introduction of vaccines brought hope, but there was also uncertainty with questions about their efficacy, their constant need for booster shots because of the emergence of various SARS-CoV-2 strains, and concerns about long COVID underscored the urgency for effective solutions to combat the virus and manage its associated immune response (Cosar et al. 2022; Raveendran, Jayadevan & Sashidharan 2021; Steenberg et al. 2023).

The intricate relationship between the virus and the immune system highlighted the critical role of managing inflammatory responses, especially in the respiratory systems, in mitigating the severity of COVID-19 (Boechat et al. 2021; Schultze & Aschenbrenner 2021). This has brought ethnobotanical research to the forefront as a promising avenue for identifying medicinal plants capable of modulating the inflammatory response associated with SARS-CoV-2 infection and bolstering the body's defence mechanisms. Ethnobotany, a multidisciplinary field that investigates the traditional knowledge and uses of plants by indigenous populations, offers a treasure trove of information about therapeutic plants (Iwu 2002). For centuries, South African communities have harnessed the healing properties of their diverse flora to address a broad spectrum of health conditions (Hendricks et al. 2021). This study aims to conduct an ethnobotanical survey to identify medicinal plants used in South Africa that are reported to alleviate SARS-CoV-2 viral infection and its associated inflammatory response. Additionally, the study will assess the economic impact of these plants, exploring their role in providing both health and financial relief during the COVID-19 pandemic.

Research methods and design

Ethnobotanical study

A desktop ethnobotanical study was conducted on medicinal plants with coupled anti-inflammatory and anti-viral activity with the potential to relieve SARS-CoV-2-related inflammatory response in the upper and lower respiratory tract system. The data were collected using search engines such as Google Scholar, PubMed, ScienceDirect and Scopus using phrases such as 'medicinal plants', 'anti-inflammatory', 'antiviral', 'pharmacological activities', 'ethnobotanical survey', 'economic impact', 'social impact' and 'COVID-19'. These were used individually and in various combinations.

Information such as family name, scientific name of the plants, common name, plant part used, method of preparation, mode of administration as well as their preservation status were recorded. The South African National Botanical Institute (Index – BRAHMS Online [sanbi.org]) and Plants of the World Online (Plants of the World Online | Kew Science) were used to check the accepted scientific names, common names and the indigeneity of the plants. The Red List of South African plants (http://redlist.sanbi.org/) and The International Union for Conservation of Nature's Red List of Threatened Species (https://www.iucnredlist.org/) were used to verify the preservation status of the plants. Each of the identified plant species was further reviewed for their biological activities which provides scientific support on their use against inflammation and viral infections.

Inclusion and exclusion criteria

Only plant species with reported dual antiviral and anti-inflammatory properties were recorded. Plant species not fully identified were excluded, for example, where only the genus name was given. Only English publications on the ethnobotanical studies as well as pharmacological studies on medicinal plants used against viral infections and inflammation in either *in vivo* or *in vitro* studies were included. Anti-viral as well as anti-inflammatory studies not relevant to viral respiratory infections were excluded.

Ethical considerations

Ethical clearance to conduct this study was obtained from the Sefako Makgatho Health Sciences University Research Ethics Committee (No. SMUREC/S/346/2023:PG).

Results

Ethnobotanical survey

The study identified 23 plant species from 18 different families reported to have the potential to relieve SARS-CoV-2 viral attack and the subsequent inflammatory response because of viral entry (Table 1). The plant species are listed in alphabetical order according to their plant families, common names, parts used, preparation methods, administration routes, reported traditional usage and preservation status.

Discussion

Representation of medicinal plant families and their therapeutic potential

This study provides a comprehensive analysis of the therapeutic potential of various plant families, with a particular focus on their dual roles in mitigating viral infections and inflammatory conditions. The results (Figure 1) highlight the considerable representation of specific plant families in the dataset, each of which contributes potential bioactive compounds with anti-inflammatory and antiviral properties.

The Lamiaceae family, informally referred to as the mint or deadnettle family, is the most represented group in this study, accounting for 14.8% of the plant families. This is a family of flowering plants encompassing approximately 236 genera and over 7000 species of herbs, shrubs and trees, which are globally distributed (Das, Sultana & Chandra 2023). A distinguishing characteristic of many plants within this family is their aromatic nature, with several species serving as widely utilised culinary herbs.

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TABLE 1: Medicinal plants with the potential of relieving severe acute respiratory syndrome coronavirus 2 viral attack and associated inflammatory response.

Scientific name	Common name	Plant part used	Plant preparation	Plant administration	Reported traditional usage	Preservation status	References
Acanthaceae *Andrographis paniculata* (Burm.f.) Wall. ex Nees	King of Bitters	Leaves, aerial parts	Teas, tinctures	Oral	Colds, influenza, fever, sore throat, acute cough, chronic cough	Least concerned	Panossian and Wikman (2013)
Adoxaceae *Sambucus nigra* L.	Elderberry	Berries, flowers	Syrups, infusion	Oral	Colds, influenza	Least concerned	Mahboubi (2021)
Amaryllidaceae *Allium sativum* L.	Garlic	Bulb	Fresh, dried, decoction	Oral	Influenza	Least concerned	Watt and Breyer-Brandwijk (1962), Cock and Van Vuuren (2020)
Apiaceae *Alepidea amatymbica* Eckl. and Zeyh.	Amatymbic daisy	Roots, Stems	Decoction, dried	Oral, Inhalation	Colds, Influenza	Endangered	Philander (2011)
Apocynaceae *Acokanthera oppositifolia* (Lam.) Codd	Bushman poison	Leaves	Infusion	Oral	Colds	Least concerned	Philander (2011)
Asphodelaceae *Bulbine frutescens* (L.) Willd.	Stalked bulbine	Leaves	Dried	Inhalation	Colds	Least concerned	Watt and Breyer-Brandwijk (1962), Cock and Van Vuuren (2020)
Asteraceae *Helichrysum petiolare* Hilliard and B.L.Burtt	Silver bush everlasting	Leaves, flowers and stems	Tea	Oral	Colds, coughs, fever, infections	Least concerned	Maroyi (2019)
Asteraceae *Chrysanthemum indicum* L.	Chrysanthemum	Flowers, leaves	Infusion	Oral	Fever, headaches, influenza	Least concerned	Kumar, Gautam and Raj (2021)
Asteraceae *Echinacea purpurea* L.	Purple Coneflower	Roots, aerial parts	Decoction, tea	Oral	Immune booster, colds	Least concerned	Melchart et al. (1999), Shah et al. (2007), Manayi, Vazirian and Saeidnia (2015)
Bignoniaceae *Tabebuia pentaphylla* Hemsl.	Pink Trumpet Tree	Bark	Infusion, Decoction	Oral	Fever, nasal congestion, influenza	Least concerned	Gómez and Luiz (2018)
Crassulaceae *Rhodiola rosea* L.	Rhodiola, Arctic Root	Root, rhizomes	Decoction, capsules	Oral	Colds, flu	Least concerned	Stojcheva and Quintela (2002)
Fabaceae *Sutherlandia frutescens* (L.) R.Br.	Cancer Bush	Leaves	Infusion	Oral	Influenza, colds	Least concerned	Nortje and Van Wyk (2015)
Fabaceae *Aspalathus linearis* (Burm.f.) R.Dahlgren	Rooibos tea	Leaves	Tea	Oral	Immunostimulant	Least concerned	Mckay and Blumberg (2007)
Fabaceae *Glycyrrhiza glabra* L.	Liquourice, Licorice	Rhizomes	Decoctions	Oral	Colds, influenza, bronchitis	Not evaluated	Watt and Breyer-Brandwijk (1962); Cock and Van Vuuren (2020)
Geraniaceae *Pelargonium sidoides* DC.	Black pelargonium	Roots	Decoctions, tinctures	Oral	Colds	Least concerned	Mammari et al. (2023)
Hypericaceae *Hypericum perforatum* L.	St. John's Wort	Aerial parts	Infusion, capsules	Oral	Fever, cold, nasal congestions	Least concerned	Hulley and Van Wyk (2019)
Hypoxidaceae *Hypoxis rooperi* T.Moore	African potato	Tuber	Dried, decoction	Oral	Colds, influenza	Least concerned	Mhlongo and Van Wyk (2019)
Lamiaceae *Leonotis leonurus* (L.) R.Br.	Wild dagga	Leaves, stem	Infusions, decoction	Oral	Coughs, colds, bronchitis, infections, fever, influenza	Least concerned	(Nsuala, Kamatou and Enslin 2023)
Lamiaceae *Melissa officinalis* L.	Lemon Balm	Leaves	Infusion, essential oils	Oral, Topical	Colds, flu	Least concerned	Hulley and Van Wyk (2019)
Lamiaceae *Origanum vulgare* L.	Oregano	Leaves	Fresh, dried, essential oil	Oral, topical	Fever, respiratory disorders.	Least concerned	Han et al. (2017)

Table 1 continues on the next page →

TABLE 1 (Continues ...): Medicinal plants with the potential of relieving severe acute respiratory syndrome coronavirus 2 viral attack and associated inflammatory response.

Scientific name	Common name	Plant part used	Plant preparation	Plant administration	Reported traditional usage	Preservation status	References
Lamiaceae *Rosmarinus officinalis* L.	Rosemary	Leaves, stems	Fresh, dried, essential oil	Oral, topical	Colds, flu	Least concerned	Mersin and Işcan (2022)
Lauraceae *Cinnamomum verum* J.Presl	Cinnamon	Bark	Powder, Decoction	Oral	Cold, influenza	Least concerned	Rawat, Verma and Joshi (2019)
Oleaceae *Olea europaea* L.	Olive Leaf	Leaves	Infusion, capsules	Oral	Influenza	Least concerned	Salamanca et al. (2021)
Rutaceae *Agathosma betulina* (P.J.Bergius) Pillans	Round leaf buchu	Leaves	Infusion	Oral	Colds	Least concerned	De Beer and Van Wyk (2011)
Theaceae *Camellia sinensis* (L.) Kuntze	Green Tea	Leaves	Infusion	Oral, topical	Colds, flu	Least concerned	Hulley and Van Wyk (2019)
Zingiberaceae *Curcuma longa* L.	Turmeric	Rhizomes	Powder, decoction, capsules	Oral, topical	Cough, colds	Least concerned	Pandey et al. (2020), Fuloria et al. (2022)
Zingiberaceae *Zingiber officinale* Roscoe	Ginger	Rhizomes	Fresh, dried, decoction	Oral, topical	Colds, influenza, sinusitis	Least concerned	Hulley and Van Wyk (2019)

Note: Please see the full reference list of the article, Aphane, T., Gololo, S.S. & Thibane, V.S., 2025, 'Ethnobotanical survey and economic impact of plants used to relieve COVID-19 related infections', *Journal of Medicinal Plants for Economic Development* 9(1), a274. https://doi.org/10.4102/jomped.v9i1.274.

Notably, certain medicinal plants within the Lamiaceae family, such as *M. officinalis*, are acknowledged for their dual antiviral and anti-inflammatory properties. A recent study by Draginic et al. (2022) demonstrated that extracts of *M. officinalis* exhibited significant anti-inflammatory and antioxidant effects. Other studies identified rosmarinic acid from *M. officinalis* as the most abundant constituent in the extracts, a compound that has been associated with the plant's therapeutic potential (Gonçalves et al. 2022). Other studies further demonstrated significant antiviral properties of *M. officinalis*, particularly against respiratory viruses (Jalali et al. 2016). Studies have shown that this plant can combat various viruses, including the SARS-CoV-2 and Avian influenza A virus (H9N2) (Behzadi et al. 2023; Pourghanbari et al. 2016). The essential oil of *M. officinalis* has been found to inhibit the replication of the H9N2, especially when the virus is incubated with the oil before cell infection (Pourghanbari et al. 2016).

The Asteraceae and Fabaceae families, each representing 11.1% of the identified families, also feature prominently for their therapeutic benefits against inflammation and viruses. For instance, *E. purpurea* from the Asteraceae family contains polysaccharides and alkamides known for their immune-stimulating and anti-inflammatory effects (Manayi et al. 2015; Burlou-Nagy et al. 2022). Similarly, plants within the Fabaceae family, such as *Glycyrrhiza glabra* and *Trifolium pratense*, exhibit potent anti-inflammatory properties attributed to their flavonoid content (Lee et al. 2020; Sharma et al. 2017; Wahab et al. 2021). These plants also demonstrated promising antiviral activity, further emphasising their dual potential in combating infectious diseases.

The Zingiberaceae family, comprising 7.4% of the families, includes well-known medicinal plants such as *Zingiber officinale* and *Curcuma longa*. These plants are rich in bioactive compounds such as gingerol and curcumin, respectively, which possess strong anti-inflammatory properties by modulating key inflammatory pathways (Alolga et al. 2022; Mao et al. 2019). Moreover, curcumin has demonstrated significant antiviral effects against various viruses, further highlighting the therapeutic potential of Zingiberaceae plants against viral infections (Jennings & Parks 2020). This diverse array of plant families provides a rich resource for exploring novel therapeutic options to alleviate respiratory inflammation associated with viral infections. Further research into these plants and their active constituents may yield valuable insights for developing complementary treatments or preventive measures targeting viral-induced inflammatory responses in the respiratory system.

Distribution and therapeutic significance of medicinal plant parts used

The distribution of medicinal plant parts used as reported in the literature reveals interesting patterns and preferences among researchers and traditional practitioners (Figure 2). According to the results of study, leaves are the most commonly utilised plant part, accounting for 31.0% of the reported use cases. This prevalence could be attributed to several factors: leaves are often rich in bioactive compounds such as alkaloids, flavonoids and essential oils, making them effective for various medicinal purposes (Gutiérrez-Grijalva et al. 2020; Zandavar & Afshari Babazad 2023). Moreover, leaves are relatively easy to harvest without causing significant harm to the plant, which aligns with principles of sustainable plant usage (Ahad et al. 2021).

Rhizomes and roots, with each accounting for 14.3% of reported use, were also a popular choice. These underground parts often store a high concentration of secondary metabolites, including polyphenols and terpenoids, which contribute to their therapeutic properties (Das et al. 2014). Furthermore, rhizomes and roots have historically been used in traditional medicine systems globally, leading to their continued prominence in medicinal plant research.

The usage of flowers (11.9%) and aerial parts (7.1%) also reflects specific therapeutic benefits associated with these plant components. Flowers often contain volatile compounds and essential oils, contributing to their use in aromatherapy. Aerial parts, encompassing leaves, stems and flowers, provide a comprehensive source of bioactive compounds and are often employed for holistic medicinal applications (Thangaleela et al. 2022).

Interestingly, stem (7.1%) and bark (4.8%) usage are relatively moderate compared to other parts. This could be attributed to concerns around sustainable harvesting practices. Harvesting stems or bark can be more damaging to the plant compared to leaves or aerial parts, potentially leading to conservation issues if not managed responsibly (Van Wyk & Prinsloo 2018).

The relatively low utilisation of seeds (2.4%), tubers (2.4%), berries (2.4%) and bulbs (2.4%) could be because of several factors. Seeds and berries are often used for specific medicinal purposes or as sources of oils rather than primary therapeutic agents (Sławińska, Prochoń & Olas 2023). Tubers and bulbs, although rich in nutrients and bioactive compounds, may require specific processing or preparation methods, impacting their widespread use (Chandrasekara 2019). Conservation considerations are crucial when studying medicinal plant usage. Overharvesting of specific plant parts, especially those with slow growth rates or limited distribution, can threaten local ecosystems and traditional knowledge systems (Chen et al. 2016). Sustainable harvesting practices, coupled with cultivation efforts are essential to preserve biodiversity and ensure the availability of medicinal plants for future generations.

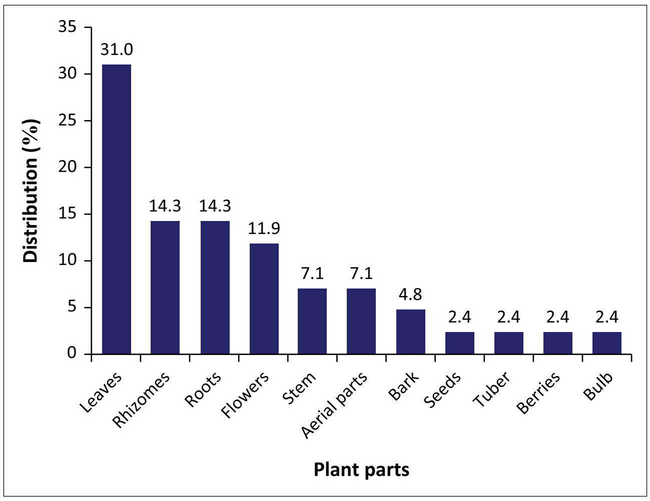

FIGURE 2: Medicinal plant parts reported for use in research studies, as documented in the literature.

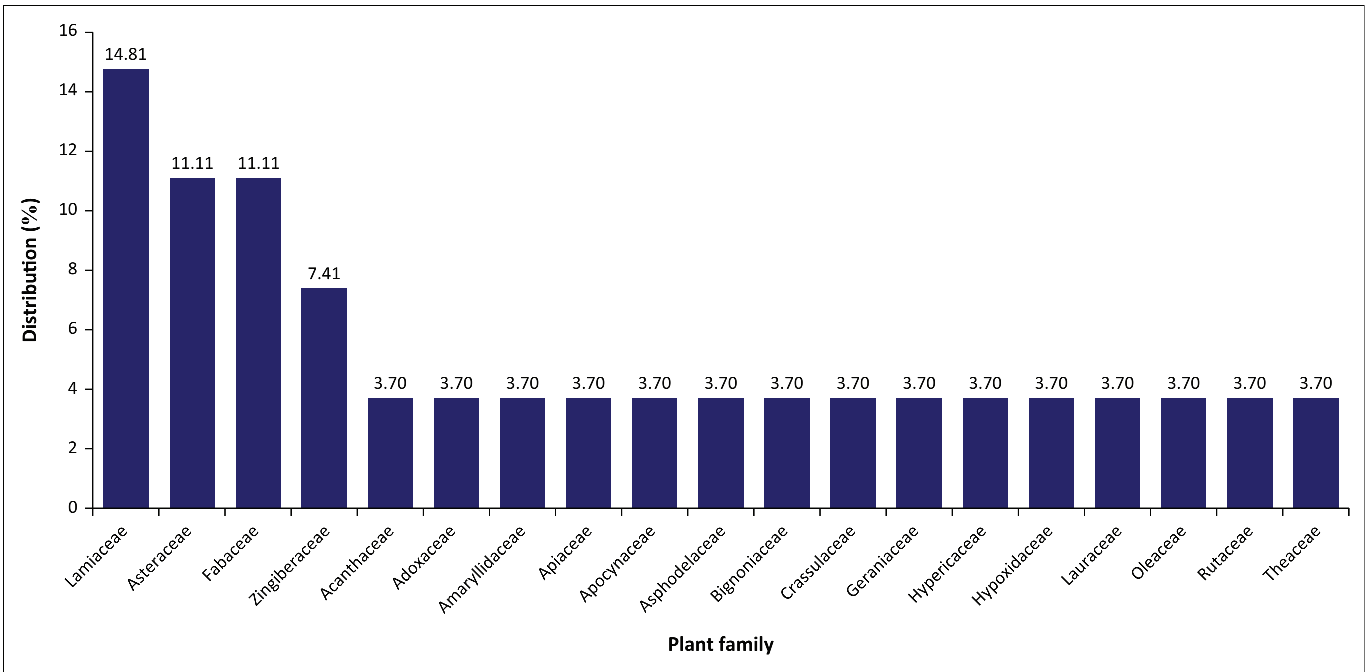

FIGURE 1: Medicinal plant families reported to be used for respiratory ailments with dual antiviral and anti-inflammatory properties.

Traditional plant preparation methods

The distribution of various plant preparation methods has emerged as a crucial factor in understanding the use of medicinal plants in traditional practices (Figure 3). The most frequently observed method was decoction, which accounted for 24.0% of the preparations reported and was closely followed by infusion accounting for 22.0%. This suggests a substantial reliance on boiling plant materials to release beneficial compound material to extract its medicinal properties (Bitwell et al. 2023). Dried preparations made up 14.0% of the total, highlighting their role in preserving plant material for extended use. The drying process predominantly involved sun drying, which is a traditional and widely accessible method. This method helps to maintain the medicinal properties of plants and allows for long-term storage, making it a practical approach in traditional medicine (Fotsing et al. 2021). Teas, fresh leaf preparations and capsules each constituted 8.0%, reflecting their accessibility and immediate availability for therapeutic use. These methods provide a standardised and convenient way to ingest plant-based medicine, which can enhance patient adherence and dosage precision (Nafiu et al. 2017).

Essential oils accounted for 6.0%, indicating a focus on concentrated aromatic compounds, while tinctures were observed at 4.0% and powders at 4.0% as well. Tinctures offer concentrated forms of plant extracts, whereas powders provide shelf-stable options for medicinal use. Lastly, syrups were the least common method, making up 2.0% of the preparations, which could typically be used for specific groups such as children or individuals with taste preferences.

Understanding the preferred methods of plant preparation is crucial for optimising the efficacy, safety and accessibility of traditional herbal remedies. Each method presents unique benefits and challenges, influencing how medicinal plants are utilised and incorporated into healthcare practices. Further investigation into these methods could yield valuable insights into their effectiveness and potential applications in contemporary medicine.

Plant administration method

The administration method is a significant determinant in the efficacy of medicinal plants with dual antiviral and anti-inflammatory properties against respiratory viral infections. Figure 4 reveals a fascinating pattern on administration methods where inhalation, which directly delivers the medicine to the respiratory system, was initially presumed to be the most prevalent method. However, the results as analysed indicate that oral administration is the predominant method, representing 75.0%. This unexpected preference for oral consumption over inhalation prompts an investigation into the potential reasons for this choice.

One explanation for the high percentage of oral administration could be the anticipated systemic benefits of these medicinal plants. When these plants are consumed orally, the bioactive compounds can circulate throughout the body, potentially impacting systemic inflammation beyond the respiratory system (Corsi et al. 2020). Furthermore, oral administration might be more convenient and familiar to the people, as it is a typical way to administer medications. This familiarity could enhance patient compliance and overall treatment outcomes, particularly in the context of viral infections that affect multiple organ systems.

Topical administration, used in a minor 19.4% of cases, suggests a targeted approach, possibly for localised symptom relief. The concurrent use of topical application and oral ingestion may indicate a comprehensive treatment strategy that addresses both respiratory and external symptoms simultaneously. This combination highlights the versatility of medicinal plants in managing inflammation caused by viral infections in various parts of the body. Although inhalation was expected to be the primary method because of its direct delivery to the respiratory system, its relatively low representation (5.6%) in the data raises further questions.

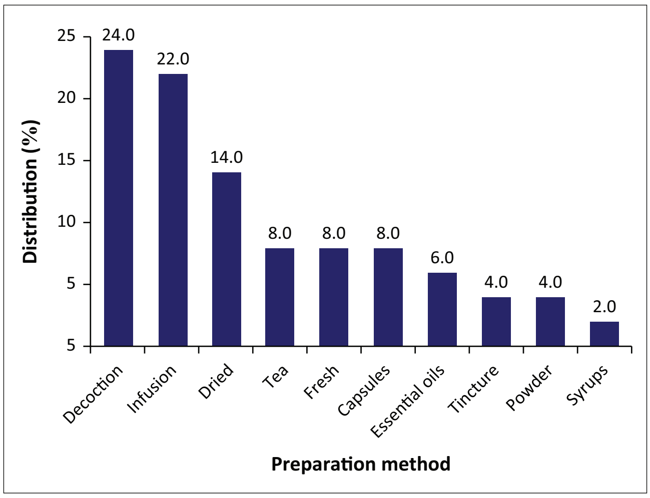

FIGURE 3: Preparation methods reported for medicinal plants, as documented in the literature.

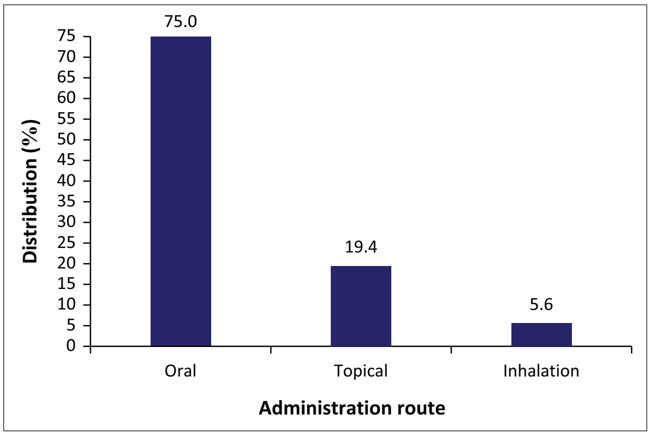

FIGURE 4: Administration routes reported for medicinal plant use, as documented in the literature.

Traditional usage of medicinal plants

Plants possessing both anti-inflammatory and antiviral characteristics have been widely reported to be integral to traditional medicine (Trivedi et al. 2022). They have been employed to address a spectrum of health conditions as shown in Figure 5 with a particular emphasis on respiratory infections. Their primary application is in the management of colds and influenza as documented in recent studies (Hulley & Van Wyk 2019; Mhlongo & Van Wyk 2019; Nortje & Van Wyk 2015). Another study by Maroyi (2019) further reported on medicinal plant usage against coughs, fever and other infections. Beyond addressing respiratory infections, these plants have been identified to possess immunostimulant properties and bolster immune function (Manayi et al. 2015; Mckay & Blumberg 2007). These plants also offer relief for other symptoms linked to respiratory infections, such as nasal congestion and sore throat, as observed by Panossian and Wikman (2013). Their use extends to the treatment of bronchitis, as indicated by Cock and Van Vuuren (2020). Moreover, these plants have been found to confer additional health benefits. They serve as adaptogens for stress reduction, provide mood support and aid in immune support. They also exhibit antioxidant properties and are utilised for weight management, as outlined by Pandey et al. (2020).

Economic impact of medicinal plants

The economic implications of medicinal plants are vast, particularly within the context of the COVID-19 pandemic, which exposed the fragility of healthcare systems globally and highlighted the urgent demand for affordable, accessible therapeutic interventions (Lim, The & Tan 2021). This research highlights the significance of medicinal plants, not only as viable alternatives to conventional pharmaceuticals but also as critical components of local economies, especially in rural South African communities.

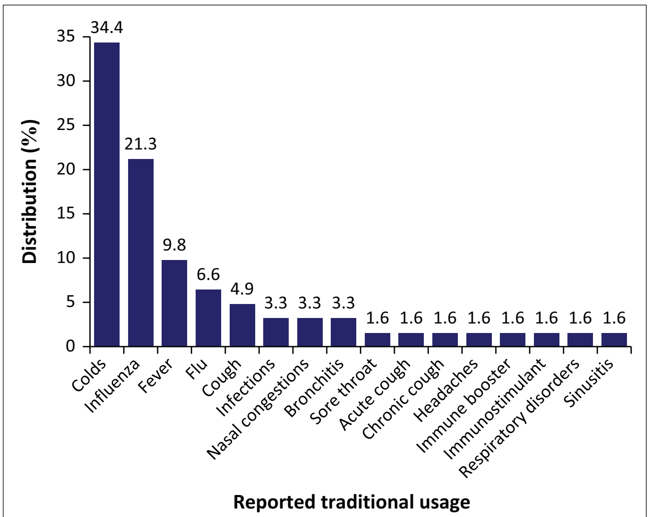

FIGURE 5: Percentage distribution of conditions reported to be treated with medicinal plants, as documented in the literature.

Historically, medicinal plants have been the cornerstones of traditional healthcare systems, and their relevance has resurfaced in the wake of the pandemic (Gogoi, Dowara & Chetia 2024). As public health measures stretched healthcare infrastructures, many turned to traditional remedies from indigenous flora to alleviate COVID-19 symptoms (Mutombo et al. 2023). The growing demand for these natural treatments presents an opportunity to invigorate local economies through the cultivation, harvesting and trade of medicinal plants (Mofokeng 2022). This becomes particularly vital in areas where modern healthcare facilities are limited, and where traditional knowledge forms an essential foundation for health management.

In this context, the Lamiaceae family, which is prominently represented in this study, serves as an excellent example. Their aromatic nature likely contributes to their high usage rate, as many Lamiaceae species are rich in essential oils with antimicrobial, antiviral and anti-inflammatory properties (Ramos Da Silva et al. 2021). These properties make them particularly effective for treating respiratory infections, where volatile compounds help clear airways and reduce inflammation (Pasdaran, Pasdaran & Sheikhi 2016). In addition, the culinary use of these species enhances their economic value. Their dual role as medicinal and culinary herbs provides economic opportunities for households, especially in regions with limited access to pharmaceutical treatments. This dual functionality supports both health and livelihood, reinforcing their economic viability and widespread cultivation.

The cultivation of these medicinal plants holds significant potential to uplift rural economies, creating employment and generating income. By fostering sustainable practices in the harvesting and trading of these plants, communities can not only strengthen their economic resilience but also preserve invaluable traditional knowledge (Van Wyk & Prinsloo 2018). For example, the production and sale of herbal remedies can empower local farmers while encouraging biodiversity conservation by promoting the cultivation of a variety of species, rather than a focus on commercial monocrops.

Moreover, the global herbal medicine market has seen remarkable growth in recent years, driven by a rising consumer inclination towards natural and holistic treatments (Khan & Ahmad 2019). Industry forecasts predict substantial growth in this sector, offering further prospects for economic advancement in regions prioritising the cultivation of medicinal plants (Mofokeng 2022). By tapping into this expanding market, South African communities stand to bolster their economic standing while contributing to public health solutions, particularly during periods of crisis.

Nonetheless, the economic potential of medicinal plants is not without challenges. Overharvesting poses a serious threat to both the species and the ecosystems from which they are derived (Shukla 2023). Some species identified in this study, such as *Alepidea amatymbica*, are already facing conservation risks, which could negate the economic benefits associated with their usage. Therefore, it is essential to develop sustainable harvesting and conservation strategies that protect these valuable resources while maximising their economic potential. Community-based conservation programmes could play a pivotal role, engaging local populations in sustainable management practices and fostering awareness of biodiversity preservation (Smardon 2021).

In parallel, there is an urgent need for focused research and development around medicinal plants. Scientific validation of their efficacy and safety will enhance their credibility and promote their integration into formal healthcare systems. Collaborative efforts between researchers, traditional healers and local communities can facilitate the creation of sustainable use protocols and pave the way for these plants to be incorporated into modern health management frameworks (Davis & Choisy 2024). Such interdisciplinary approaches can drive innovation while honouring traditional knowledge and practices.

The economic impact of medicinal plants extends far beyond immediate financial gains. Their cultivation and use can lead to substantial healthcare cost savings by offering affordable alternatives to mainstream medicines (Odubo et al. 2023). During the pandemic, the use of these medicinal plants contributed to faster recovery from illness, allowing individuals to return to work more quickly and lessening the overall strain on healthcare systems (Zafar et al. 2021). By integrating medicinal plants into health strategies, communities can not only improve health outcomes but also reduce the economic pressures on both individuals and healthcare infrastructure.

Conclusion

This study highlighted the significant dual potential of medicinal plants in addressing both the health challenges posed by viral infections such as SARS-CoV-2 and their associated economic benefits. The identified plant species, particularly from the Lamiaceae family, demonstrate notable antiviral and anti-inflammatory properties, making them promising candidates for managing respiratory infections. The growing global market for medicinal plants, further boosted by the COVID-19 pandemic, shows their economic importance, particularly in developing regions where their cultivation and trade support local economies.

However, to fully harness the potential of these plants, further research is necessary to validate their therapeutic efficacy and ensure their safe integration into modern healthcare. This includes in-depth pharmacological studies, clinical trials and investigations into optimal cultivation methods to support sustainability. Regulated harvesting and ethical trade practices are also critical to preserving biodiversity and securing the long-term benefits of medicinal plants. By merging traditional knowledge with scientific validation, medicinal plants offer a promising path forward for healthcare innovation, economic growth, and environmental conservation.

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Competing interests

The author, S.S.G. serves as an editorial board member of this journal. The authors, S.S.G., T.A. and V.S.T. have no other competing interests to declare.

Authors' contributions

V.S.T. and S.S.G. were responsible for the conceptualisation of the study, funding acquisition and supervision. Data collection, formal analysis and investigation was conducted by T.A. Project administration was managed by V.S.T. and T.A. The methodology and writing of the original draft of the article was completed by all the authors. All authors reviewed and approved the final version of the article.

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Data availability

The data that support the findings of this study are available on reasonable request from the corresponding author, V.S.T.

Disclaimer

The views and opinions expressed in this article are those of the authors and are the product of professional research. It does not necessarily reflect the official policy or position of any affiliated institution, funder, agency or that of the

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